The Critical Velocities in Nonlinear Problems of the Theory of Aeroelsticity [illegible]

M.J. Lighthill (1953). There are 5 diagrams and 5 references, 4 of which are Soviet and 1 English.
This article was presented by the
Kafedra "Soprotivleniye materialov" Moskovskogo energeticheskogo instituta (Chair "Strength of Materials" of the Moscow Power Engineering Institute)

SUBMITTED: March 3, 1958

Card 5/5

BOLOTIN V V

24-58-3-4/38

AUTHOR: Bolotin, V. V. (Moscow)

TITLE: Statistical Methods in the Non-linear Theory of Elastic Shells (Statisticheskiye metody v nelineynoy teorii uprugikh obolochek)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 3, pp 33-41 (USSR)

ABSTRACT: In the non-linear theory of elastic shells two critical loads are distinguished, the lower, at which the bifurcation of the equilibrium shapes of the ideal shell occurs and the upper, where the initial type of elastic deflection first ceases to be unique. Experimentally measured buckling loads lie between the two according to the conditions and thoroughness of the test. A safe load may lie above the lower critical load, because an initial disturbance (deflection) sufficient to overcome the energy barrier separating one condition from the other, will not always be present. It has been pointed out that the lower critical load can be negative (Vol'mir, A.S., "Flexible Plates and Shells", Gostekhizdat, 1956). The "equal energy load" (Karman, T. and Tsien, H.S., "The Buckling of Thin Cylindrical Shells under Axial Compression", J.Aeronaut.Sci., Vol.8, Nr 8 1941) ignores the initial deflection. On the other hand, the actual value of

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Statistical Methods in the Non-Linear Theory of Elastic Shells.

the initial deflections is required in the Donnel method (Donnel L.H. and Wan C.C., "Effect of Imperfections on Buckling of Thin Cylinders", J.Appl.Mech. Nr 3, 1950). The present paper introduces the statistical method to help in the prediction of the safe load and in the evaluation of buckling tests. In this approach, the initial deformation enters as one factor of a group embracing a finite number of parameters by which the state of the shell under load is defined. Most of the parameters are postulated to be random quantities. The statistical distribution law of these random quantities must be assumed but can sometimes be obtained from a sufficient number of tests. Statistical analysis is used to predict the mathematical expectation of the buckling of the shell under a given load. The practical importance of the statistical approach lies in the fact that the probability of buckling for a given multiple of the lower critical load varies predictably with the conditions of the problem. Moreover, the rate of increase of probability with the increase of the multiplying factor also depends on the nature of the shell and its fixing

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Statistical Methods in the Non-Linear Theory of Elastic Shells.

in a manner derivable by analysis. Furthermore, the analysis shows the degree of sensitivity of the probability of buckling in relation to the scatter in the initial disturbance (e.g., deformation). Thus a useful factor can be added to the pessimistic safe load, provided the initial deflections and their scatter are controllable. There are 7 illustrations, including 4 graphs, and 5 Soviet and 3 English references.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Institute)

SUBMITTED: October 14, 1957.

Card 3/3

1. Elastic shells--Theory

BOLOTIN, V.V.

Investigating natural vibrations of a flexible shaft caused by the action of internal friction or related factors. Nauch. dokl.vys.shkoly; mash.i prib. no.4:48-52 '58.(MIRA 12:5)

1. Stat'ya predstavlena kafedroy "Soprotivleniye materialov" Moskovskogo energeticheskogo instituta.
(Shafting--Vibration)

BOLOTIN, V V

SOV/24-58-10-33/34

AUTHOR: Panovko, Ya. G.

TITLE: A Conference on Elastic Vibrations at the Institute of Mechanical Engineering of the Academy of Sciences of the Latvian SSR (Soveshchaniye po voprosam uprugikh kolebaniy v Institute mashinovedeniya Akademii nauk Latviyskoy SSR)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 10, pp 158-159 (USSR)

ABSTRACT: This Conference took place on June 11-15, 1958, in Riga. Altogether over 70 people took part in the conference (apart from those normally based at Riga). Eleven papers were read:
1) "The effect of vibration on systems with dry friction", by I. I. Blekhman and G. Yu. Dzhanelidze (Leningrad),
2) Two papers on dynamic problems in the nonlinear theory of plates and the shells by V. V. Bolotin and A. S. Vol'mir (Moscow),
3) "A qualitative study of the form and frequencies of natural vibrations of thin elastic shells", by A. L. Gol'denveyzer (Moscow),
4) "Some problems in connection with vibrations of elastic rods in the case of large displacements", by Yu. S. Shkenev (Moscow),
5) "Coupled vibrations of vanes and discs in turbines" and

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A Conference on Elastic Vibrations at the Institute of Mechanical Engineering of the Academy of Sciences of the Latvian SSR

"Passage through resonance of a linear system with non-linearly varying frequency", by A. P. Filippov (Khar'kov),
6) "Some problems in the dynamics of an ideally elastic stretched thread", by V. A. Svetlitskiy (Moscow),
7) "On the similarity of dynamic processes in solid bodies", by A. G. Nazarov (Yerevan),
8) "The problem of constructional hysteresis", by Ya. G. Panovko (Riga),
9) "Constructional hysteresis in resin-metallic shock absorbers", by G. I. Strakhov (Riga).
The conference was closed with a speech by M. M. Filonenko-Borodich (Moscow).

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BOLOTIN, V.V., prof.; DARKOV, A.V., prof.; KRYUKOVSKIY, S.S., prof.;
SOKOLOV, S.N., prof.

[Program for the course in strength of materials for students not specializing in mechanics in higher technical schools] Programma kursa soprotivleniia materialov dlia nemekhanicheskikh spetsial'nostei vtuzov. Moskva, Gos.izd-vo "Sovetskaia nauka," 1959. 14 p. (MIRA 13:3)

1. Russia (1923- U.S.S.R.) Ministerstvo vysshego i srednego spetsial'nogo obrazovaniia.
(Strength of materials--Study and teaching)

BoLoTin, V.V.

25(2); 24(6) PHASE I BOOK EXPLOITATION SOV/2591

Akademiya nauk SSSR. Institut mashinovedeniya

Kolebaniya v turbomashinakh; sbornik statey (Vibrations in Turbomachines; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 117 p. Errata slip inserted. 2,300 copies printed.

Resp. Ed.: S. V. Serensen, Academician, Academy of Sciences, USSR; Ed. of Publishing House: Ya. A. Klimovitskiy; Tech. Ed.: V. V. Volkova.

PURPOSE: This collection of articles is intended for scientific research workers, engineers, and designers in the field of turbomachinery.

COVERAGE: This collection of articles deals with vibrations in turbomachinery. The following topics are discussed: vibrations and stresses in the rotor and bearings of a turbogenerator, vibrations and stability of beams, flexural vibrations of a rotating shaft, whirling speeds of a flexible rotor with two unbalanced masses, acceleration through resonance of a nonlinear system, whirling speed and clearance in bearings, dynamic stresses in blades of an axial compressor, and damping of vibrations. No personalities are mentioned. References follow several of the articles.

Daychik, M.L., F.M. Dimentberg, A.S. Zil'berman, G.L. Lyudin, N.I. Prigorovskiy, and K.Ye. Sakharov. Investigation of Vibrations and Stresses in the Rotor and Bearings of a High-power Turbogenerator During Operation 5
The authors discuss an experimental investigation made on a high-power turbogenerator in order to analyze the real state of stress of the rotor and vibrations of the rotor and bearings. The dynamic behavior of the whole system of joined rotors and bearings is treated. The influences of bases and foundations are not taken into consideration.

Bolotin, V.V. Vibration and Stability of Beams Under Action of Nonconservative Forces 23
A cantilever rectilinear beam loaded by uniformly distributed following forces acting in the plane of its maximum rigidity is analyzed for stability at planar deformation. Critical parameters of the loading with and without consideration of damping are established.

Gusarov, A.A. Acceleration Through Critical Speeds of a Flexible Rotor With Two Unbalanced Masses in the Presence of Friction 51
The author derives a system of two complex differential equations as a solution to the problem. The solution is based on the following assumptions: that the mass of the shaft, the gyroscopic movements of masses caused by deflections of the shaft, and the initial deflections of the shaft are negligible; that the shaft supports are absolutely rigid; that the shaft itself is torsionally rigid; and that the acceleration through critical speeds is uniform.

Rubanik, V.P. Acceleration Through Resonance in One Case of a Nonlinear System 75
Analysis is made of a nonlinear vibrating system with one degree of freedom having a nonlinear restoring force and excited by a low-frequency sine-shaped disturbing force. The effect of the rate of acceleration on amplitudes of the motion is discussed.

Natanson, V.Ya. (Deceased). Critical Speeds of a Rotor and Clearances in Bearings 81
The effect of the clearance in rolling contact bearings on the motion and whirling speed of a rotor is discussed. Rotors having no critical speed are described together with an experimental checking installation for selecting eccentricities of disks.

Rusanova, Ye.I. Investigation of Dynamic Stresses in Blades of an Axial Compressor With a Wide Control Range 104
The basic results of an experimental investigation of dynamic stresses in blades of an axial compressor by means of wire resistance transducers placed in the root sections are presented. The behavior of the blade at various speeds, including resonance, is described.

Sergeyev, S.I. Damping of Vibrations of Anisotropoelastic Rotors 114
Conditions for successful damping of a rotor with unequal elasticity coefficients along its principal axis are discussed. The inertia and

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S/124/62/000/008/011/030
I006/I242

AUTHOR: Bolotin, V.V.

TITLE: The problem of stability of a plate in compressible gas flow

PERIODICAL: Referativnyy zhurnal, Mekhanika, no.8, 1962, 35-36, abstract 8B210. (Vopr. prochnosti materialov i konstruktsiy. M., AN SSSR, 1959, 194-204)

TEXT: The divergence phenomena and panel flutter of an infinite aspect-ratio plate is discussed on the basis of the linearized steady supersonic flow theory. One plate end is fixed, the other free. Boundaries of unstable ranges in divergence and flutter are determined.

[Abstracter's note: Complete translation.]

Card 1/1

Bolotin, V. V.

14(10); 18(7) PHASE I BOOK EXPLOITATION SOV/3189

Raschety na prochnost'; teoreticheskiye i eksperimental'nyye issledovaniya prochnosti mashinostroitel'nykh konstruktsiy; sbornik statey Vyp. 4 (Strength Calculations: Theoretical and Experimental Studies of the Strength of Machine Structural Elements; Collection of Articles, No. 4) Moscow, Mashgiz, 1959. 393 p. Errata slip inserted. 3,600 copies printed.

Editorial Commission: Ye. N. Tikhomirov (Chairman) Honored Worker in Sciences and Technology of the RSFSR, Professor, S. V. Serensen, Corresponding Member, Ukrainian SSR Academy of Sciences, Doctor of Technical Sciences, Professor, G. S. Glushkov, Doctor of Technical Sciences, Professor, S.D. Ponomarev, Doctor of Technical Sciences, Professor, S. N. Sokolov, Doctor of Technical Sciences, Professor, N. D. Tarabasov, Doctor of Technical Sciences, Professor V. M. Makushkin (Secretary) Candidate of Technical Sciences, Docent. Ed.: N. D. Tarabasov, Doctor of Technical Sciences, Managing Ed. for Literature on General Technical and Transport Machine Building: V. I. Kubarev, Engineer; Ed. of Publishing House: R. M. Korableva, and A. G. Nikitin; Tech. Eds.: Z. I. Chernova, and V. D. El'kind.

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PURPOSE: This book is intended for engineers and designers in machine building as well as for engineers of other specialties working on stress analysis. It may be used as a text by students in the field.

COVERAGE: This book contains original stress analysis calculations made on machinery elements and parts. Analyses are made of coiled springs with an arbitrary helix angle, bending of turbine discs, strain state of flat pistons, and a circular cylinder. A number of original applications of general methods of the theory of elasticity to the study of lateral bending and torsion of rods is given. In the calculations on stability, new methods of determining critical forces for compressed rods and analyzing the stability of circular and ring-shaped plates are applied. Calculations for dynamic loadings are represented by a study of the analysis of variations of the indicators of devices during vibration. References accompany individual articles.

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BOLOTIN, V.V.

PHASE I BOOK EXPLOITATION SOV/3416

Akademiya nauk SSSR. Institut mashinovedeniya

Voprosy prochnosti materialov i konstruktsiy (Problems of Strength of Materials and Structures) Moscow, 1959. 399 p. Errata slip inserted. 3,200 copies printed.

Resp. Ed.: D. N. Reshetov, Professor, Doctor of Technical Sciences; Ed. of Publishing House: G. B. Gorshkov; Tech. Ed.: S. T. Shikin.

PURPOSE: This book is intended for engineers and scientists concerned with the problems of the strength of materials and construction

COVERAGE: The book contains 28 articles on the strength of materials in general and of machine construction in particular. This collection was prepared under the direction of the Institute of Mechanical Engineering of the AS USSR in honor of Sergey Vladimirovich Serensen, one of the founders and directors of the national school of strength of materials, who recently completed 30 years of scientific activity. The preface gives a short sketch of his life and professional activities. The collection is divided into two parts. The first part contains 13 articles on general problems of strength and the strength of machine construction materials. The second part contains 15 articles on dynamics and calculation of strength and rigidity. There are references at the end of each article.

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SOV/1[illegible]-59-[illegible]-17/40

AUTHORS: Bolotin, V.V., Vlasov, V.Z. (deceased) and Gol'denblat, I.I.
(Moscow)

TITLE: The Development of Structural Mechanics (O razvitii stroitel'noy mekhaniki)

PERIODICAL: Izvestiya Akademii nauk SSSR OTN, Mekhanika i mashinostroyeniye, 1959, Nr 2, pp 122-133 (USSR)

ABSTRACT: A review, in which the subject is dealt with under the following heads: traditional problems of structural mechanics; problems of constructional work beyond the elastic limit; stability; dynamic problems; aeroelasticity and allied problems; calculation of constructions under random forces; problems of thermo-elasticity, thermo-plasticity and thermal creep. There are 93 references, of which 68 are Soviet, 22 English and 3 German.

SUBMITTED: January 3, 1959.

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SOV/179-59-3-9/45

AUTHORS: Bolotin, V. V., Gavrilov, Yu. V., Makarov, B. P. and Shveyko, Yu. Yu. (Moscow)

TITLE: Non-linear Problems of Stability of Plane Panels at High Supersonic Velocities (Nelineynyye zadachi ustoychivosti ploskikh paneley pri bol'shikh sverkhzvukovykh skorostyakh)

PERIODICAL: Izvestiya Akademii nauk, SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1959, Nr 3, pp 59-64 (USSR)

ABSTRACT: The paper is a continuation of previous work (Refs 1 and 6). The question of the stability of plates and shells, exposed to a current of compressed gas, has so far been discussed in terms of a linear representation (Refs 1-5). For sonic flow and for moderate supersonic numbers M this hypothesis is apparently completely justified. However, for larger supersonic velocities, aerodynamic non-linearity becomes very appreciable. As was shown by Bolotin (Ref 5), solutions different from the unperturbed ones appear in aeroelastic problems, allowing for aerodynamic non-linearity, at velocities below the critical value. Among these solutions are some which are

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stable in relation to sufficiently small disturbances. These solutions can be realised if the elastic system which is subjected to the sub-critical velocity is sufficiently irregular. All real constructions have some irregularities (defects of manufacture, deformations arising from aerodynamic heating, vibrations under the influence of atmospheric turbulence and other non-stationary factors, etc.). Thus in some cases, the critical velocity determined by the linear aeroelastic theory is only a lower limit to the critical velocity for real constructions. In the present paper, the edges of the plate are assumed to be simply supported and elastically restrained against axial displacements; the pressure on the plate is given by:

$$p = p_{\infty} \left(1 + \frac{\varkappa - 1}{2} \frac{v}{a_{\infty}}\right)^{\frac{2\varkappa}{\varkappa - 1}} \qquad (1)$$

where p is the pressure of the unperturbed gas, v is the normal component of surface velocity of the plate, a_{∞} is the velocity of sound in the unperturbed gas and

$\varkappa$ is the polytropy index. The component of load normal to the plane is

$$q = -\rho_0 h \frac{\partial^2 w}{\partial t^2} - 2\rho_0 h \varepsilon \frac{\partial w}{\partial t} + \Delta p \qquad (6)$$

where w is the deflection, ρ_0 is the density and h the thickness of the plate, ε is the damping coefficient, and Δp is the excess pressure, which can be expressed in terms of the Mach number and polytropy index by means of Eq (1). The problem then reduces to the investigation of the non-linear equation for the deflection of the plate, which contains q, subject to the boundary conditions. One solution is expressed as a double sine series and is dealt with both by an approximate numerical method, and with the aid of an electronic calculating machine. The results of the calculations for particular cases are shown graphically (Figs 4, 5 and 6), and indicate the existence of flutter in the panel. Acknowledgments are expressed to N. I. Chelnokov

SOV/179-59-3-9/45

Non-linear Problems of Stability of Plane Panels at High Supersonic Velocities

and Yu. R. Shneyder, of the Mathematical Machine Laboratory MEI, for participating in the calculations. There are 6 figures and 9 references, 7 of which are Soviet and 2 English.

SUBMITTED: November 18, 1958

Card 4/4

3(10), 14(8)

AUTHOR: Bolotin, V. V. (Moscow)

SOV/179-59-4-15/40

TITLE: Statistic Theory of Resistance to Earthquakes of Buildings

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye tekhnicheskikh nauk. Mekhanika i mashinostroyeniye, 1959, Nr 4, pp 123-129 (USSR)

ABSTRACT: It is attempted to develop a theory which ensures an adequate representation of the reaction of buildings to seismic effects at a minimum number of empirical data. It is assumed that the seismic effect can be expressed by means of certain non-stationary random time functions which depend on the final number of random parameters. On the basis of a not too large number of accelerograms, the common density of the probability distribution can be found for these parameters characterizing earthquakes as a whole (their intensity, duration, spectral composition, etc). At fixed parameter values, every unsteady function is approximately expressed by determinate time functions and stationary random functions, the spectral densities of which are also determined by the accelerogram analysis. It is shown that - if the complete system of correlation functions of seismic effects is known - the complete system of correlation functions for the generalized coordinates, bending moments,

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Statistic Theory of Resistance to Earthquakes of Buildings SOV/179-59-4-15/40

lateral forces, stresses, etc can be found by means of known methods, and the local density of probability for the values mentioned can then be found according to this system. The probable number of excesses of the values found in the time unit, and the probability of an excess of these values during the whole earthquake are then determined. This probability is a conditional one. It is shown that the total probability can be found by use of the probability density of parameters characterizing the earthquake as a whole. The final results of a system with only one degree of freedom can be represented in the form of curves which are similar to the known "acceleration spectra". An important difference lies in the fact that any calculated value of these curves must be determined in dependence on the previously determined and anticipated life of the building. The theory developed can be used for linear systems. If, however, the nonlinearities are not very large, the method of statistic linearization, which was successfully applied to the theory of automatic control and filtration of noise (Ref 10), can also be used in the theory of resistance to earthquakes. Thus, the method described here can - after

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Statistic Theory of Resistance to Earthquakes of Buildings SOV/179-59-4-15/40

a certain generalization - also be extended to nonlinear systems. I. L. Korchinskiy (Ref 3) and V. I. Pugachev (Ref 10) are mentioned. There are 10 references, 5 of which are Soviet.

SUBMITTED: October 27, 1958

Card 3/3

BOLOTIN, V.V., doktor tekhn.nauk prof.

Some new problems in the dynamics of shells. Rasch.na prochn. no.4:331-365 '59. (MIRA 13:4)
(Elastic plates and shells)

24.4100 1327, 1132 1538

31277
S/124/61/000/010/007/056
D251/D301

AUTHOR: Bolotin, V.V.

TITLE: On a mechanical model describing the mutual influence of parametric and forced oscillations

PERIODICAL: Referativnyy zhurnal. Mekhanika, no. 10, 1961, 16, abstract 10 A127 (Tr. Mosk. energ. in-ta, 1959, no. 32, 54-66)

TEXT: The problem is discussed of an elastically reinforced body of mass m under the action of external periodic forces in the vertical direction. The unperturbed motion takes the form of forced oscillations in the vertical direction. The stability of that motion, for which there is an equation in variations is considered. It is shown that the unperturbed motion is asymptotically stable with respect to a vertical perturbance. Except in the region of instability characterized for a general parametric exciting force, the possibility is shown of there being unstable oscillations in the

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On a mechanical model... S/124/61/000/010/007/056
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region of resonance of the unperturbed motion. Boundaries of the regions of stability and instability are established, dependent on the depth of the modulation. It is stated in what form the results obtained may be applied to calculating the vibrations of a massive foundation under an installation with periodic forces and also the vibro-insulation. [Abstracter's note: Complete translation]

X

Card 2/2

BOLOTIN, V. V.

"Statistical Theory of the Aseismic Design of Structures."

report submitted for the Second World Conference on Earthquake Engineering, Tokyo and Kyoto, Japan, 11-18 July 1960.

Bolotin, V. V.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb '60.

1. A. A. Abbasov, A. F. Kasimov, Ia. A. Shvarts (Baku): Supersonic motions of visco-plastic solids and the basis for improving well cementation.
2. A. A. Abbasov, V. M. Makhtiev, A. A. Mirsalan (Baku): Heat transfer in moving viscous and visco-plastic solids.
3. B. L. Abramian (Erevan): Torsion of cylindrical shafts.
4. B. L. Abramian, A. A. Babloian (Erevan): Torsion of circular hollow shafts with longitudinal notches.
5. V. L. Agamirov, A. S. Volmir, V. E. Mineev (Moscow): Buckling and post-buckling behavior of shells under dynamic loading.
6. A. Ia. Aleksandrov (Novosibirsk): Some relations between the solutions of plane and axisymmetrical problems in the theory of elasticity.
7. A. Ia. Aleksandrov (Novosibirsk): Experimental investigation of plane elastic-plastic problems by means of photoelastic films.
8. V. M. Aleksandrov, Iu. A. Ustinov (Rostov-on-Donu): Some contact problems in elasticity.
9. B. A. Aleksandrian, N. Kh. Arutiunian, M. M. Manukian (Erevan): Torsion of prismatic bars under transient creep.
10. S. A. Alekseev (Moscow): Two-dimensional bodies of equal strength.
11. N. A. Alumäe (Tallin): Axisymmetrical vibration of an elastic conical shell.
12. S. A. Ambartsumian (Erevan): On the theory of anisotropic shells and plates.
13. S. A. Ambartsumian, L. A. Movsisian (Erevan): Some problems in the theory of anisotropic (non-orthotropic) shells.
14. I. Ia. Amiro (Kiev): Stability analysis of a stiffened cylindrical shell under axial compression.
15. V. V. Andreev, A. M. Kosevich, L. V. Tanatarov (Kharkov): The inelastic deformation and residual strains in a plane layer of a solid under allotropic transformations.
16. I. G. Aramanovich (Moscow): The stress distribution in a heavy half-space with a circular hole, the edge of which is subject to non-equilibrated forces.
17. M. Arcan, M. Tannenbaum (Bucharest): Photoelastic model studies of cracked reinforced concrete beams.
18. N. Kh. Arutiunian (Erevan): The plane contact problem of the theory of creep.
19. T. V. Asonova, V. I. Zatsepina, A. A. Trapeznikov (Moscow): Shear strengths and limits of reversible strains of solutions and gels of some rubbers.
20. E. N. Baida (Leningrad): The general solution of the problem of elastic strains in a cylinder of finite length.
21. G. I. Barenblatt (Moscow): The theory of equilibrium cracks under brittle rupture.
22. G. M. Bartenev (Moscow): Rheological properties of rubber-like polymers.
23. M. F. Barshtein (Moscow): Dynamic design of structures subjected to random effects.
24. E. P. [illegible] (Moscow): Temperature distribution in container and metal during extrusion.
25. Bai en Pin (Peking), Shun Tszhu-Khua (Tsinghua), G. S. Shapiro (Moscow): On the dynamics of rigid-plastic structures.
26. V. G. Berezantsev (Leningrad): The theory of the limit state of stress in soil mechanics and its applications.
27. A. Iu. Birkgan, A. S. Volmir (Moscow): The use of electronic digital computers for solving non-linear problems in the theory of plates and shells.
28. V. I. Blokh (Kharkov): Stress displacement functions.
29. V. A. Bobin (Dnepropetrovsk): Difference-variational methods of the theory of structures.
30. V. I. Boiko (Kiev): On solving Hertz's contact problem with interior fields of plasticity.
31. V. V. Bolotin (Moscow): Method of space transformations in the non-linear theory of plates and shells.
32. V. V. Bolotin (Moscow): The non-linear problems of aeroelasticity at supersonic speeds.
33. V. V. Bolotin (Moscow): Strength and damage under action of random forces.
34. V. V. Bolotin (Moscow): The statistical theory of seismic design of structures.

Bolotin, V. V.

PHASE I BOOK EXPLOITATION SOV/3862

Raschety na prochnost': teoreticheskiye i eksperimental'nyye issledovaniya prochnosti mashinostroitel'nykh konstruktsiy; sbornik statey, vyp. 5 (Strength Analysis; Theoretical and Experimental Investigations of the Strength of Machine Elements; Collection of Articles, No. 5) Moscow, Mashgiz, 1960. 298 p. Errata slip inserted. 5,000 copies printed.

Ed.: V.N. Arbuzov, Candidate of Technical Sciences; Ed. of Publishing House: L.N. Danilov; Tech. Ed.: B.I. Model'; Managing Ed. for Literature on General Technical and Transport Machine Building (Mashgiz): A.P. Kozlov, Engineer; Editorial Board: G.S. Glushkov, Doctor of Technical Sciences, Professor; V.M. Makushin, Candidate of Technical Sciences, Docent (Secretary); S.D. Ponomarev, Honored Scientist and Technologist of the RSFSR, Doctor of Technical Sciences, Professor; S.V. Serensen, Member of the Academy of Sciences UkrSSR, Doctor of Technical Sciences, Professor; S.N. Sokolov, Doctor of Technical Sciences, Professor; N.D. Tarabasov, Doctor of Technical Sciences, Professor; and Ye.N. Tikhomirov, Honored Scientist and Technologist of the RSFSR, Professor (Chairman).

PURPOSE: The book is intended for engineers and scientists specializing in stress analysis.

COVERAGE: This collection of 15 articles deals with the design and calculation of machine elements for strength, rigidity, and stability. The collection is divided into three sections, 1) calculation for strength, 2) stress and strain analysis, and 3) calculation for stability. Methods and formulas for calculating strength parameters are presented. No personalities are mentioned. References follow several of the articles.

Trumbachev, V.F. [Candidate of Technical Sciences]. Photoelastic Investigation of Stress Distribution in Specimens Loaded Under Their Own Weight 226
Use of photoelasticity in determining the effects of stress concentration and the intensity and direction of the principal stresses in selected models are outlined.

SECTION III. CALCULATIONS FOR DYNAMIC LOAD AND FOR STABILITY OF CONSTRUCTIONAL ELEMENTS

Makushin, V.M. One Case of Stability Calculated for a Compressed Annular Disk 236
An individual case of experimental stress analysis is reported. It involves the loading of a compressed annular disk [circular plate]. Critical load coefficients are deduced and conditions for stability defined.

Trapezin, I.I. [Candidate of Technical Sciences, Docent]. Stability Conditions for a Thin Conical Shell Closed at Top and Under Lateral Hydrostatic Pressure 249
Stability conditions for a submerged thin-walled conical shell exposed to hydrostatic pressure acting sidewise upon the cone are analyzed and load limits prior to buckling defined.

Bolotin, V.V. [Doctor of Technical Sciences, Professor], and G.A. Boychenko [Candidate of Physics and Mathematics, Docent]. Investigation of the Phenomenon of Snapping [Local "Elastic" Loss of Stability] in Thin Shells Under the Impact of Dynamic Load 259
Local buckling-snapping stresses effecting thin-walled elastic shells are analyzed and equations for stability conditions derived.

Shcheglov, A.A. [Docent]. The Problem of Determining Critical [Whirling] Speeds of a Shaft of Variable Cross Section 273
Values for critical speeds of a rotating shaft are derived and the effects of deflecting forces analyzed.

Bolotin, V.V.

PHASE I BOOK EXPLOITATION SOV/4000

SOV/12-M-27

Akademiya nauk SSSR. Institut mekhaniki

Inzhenernyy sbornik, t. 27 (Engineering Collection, Vol. 27) Moscow, Izd-vo AN SSSR, 1960. 210 p. 2,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk.

Resp. Ed.: A. A. Il'yushin; Ed.: V. M. Akhundov; Ed. of Publishing House: V.M. Akhundov; Tech. Ed.: A.P. Guseva.

PURPOSE: This book is intended for engineers, applied physicists, and applied mathematicians.

COVERAGE: The book consists of 24 articles on such problems as wing theory, supersonic flow, theory of shells, stability, plasticity and elasticity, the bending of thin plates and shells, and various aspects of applied mathematics. No personalities are mentioned. References accompany most of the articles.

Filinov, M.V. On the Problem of Displacing Gas by Water 54

Bolotin, V.V. Application of Statistical Methods for the Evaluation of the Strength of Structures Subjected to Seismic Forces 58

Movchan, A.A. The Behavior of Complex Eigen Values in the Problem of Panel Flutter 70

Slobodkin, A.M. Stability of an Elastic Beam With Rigid Empennage in Supersonic Flow 77

Shkenev, Yu.S. Vibrations of an Elastic String 81

Il'yushin, A.A. Elastoplastic Stability of Structures Containing Rod Elements 87

Popov, S.M. Stability of Circular Thin Plates Beyond the Elastic Limit 92

Zubchaninov, V.G. Stability of Structural Rods Beyond the Elastic Limit 101

Tsurkov, I.S. On the Bending of a Closed Cylindrical Shell by a Concentrated Force 114

Sherman, D.I. Strains in a Physical Medium Weakened by Elliptical and Circular Holes 124

Ugodchikov, A.G. Determination of Stresses Caused by Pressing Several Circular Washers Into a Plate With Variable Interference [illegible]

Mishonov, M. On the Practical Calculation of Bending Moments of Shells Supported By a Rectangular Plane [illegible]

Pshenichnov, G.I. Statistical Calculation of Latticed Cylindrical Sloping Shells 171

Volkov, A.N. "Contact Method" in the Coupling of a Cylindrical Shell of Open and Closed Profile [illegible]

Burmistrov, Ye.F. Symmetric Bending of Nonhomogeneous and Homogeneous Orthotropic Shells of Revolution Taking Into Account Large Deflections and an Uneven Temperature Field [illegible]

Kurtin, N.S. Lower Limit of a Kinematically Maximum Admissible Load [illegible]

Levit, D.Ye. Nomographic Solution of Equations of the Fourth and Fifth Degrees [illegible]

Stepanov, R.D. Application of the Method of Asymptotic Integration to the Solution of One Equation of the Natural Vibrations of Shells [illegible]

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204400017-6

33395
S/572/60/000/006/013/018
D224/D304

10.6300

AUTHOR: Bolotin, V. V., Doctor of Technical Sciences, Professor

TITLE: Thermal buckling of plates and shells of small curvature in supersonic gas flow

SOURCE: Raschety na prochnost'; teoreticheskiye i eksperimental'nyye issledovaniya prochnosti mashinostroitel'nykh konstruktsiy. Sbornik statey, No. 6, Moscow, 1960, 190-216

TEXT: The author deduces the general equations of the problem, stating that these have been given without deduction in a previous publication; excess pressure of gas is introduced according to the well-known theory for supersonic flow. The general method of approximate solution proposed by V. V. Bolotin, Yu. V. Gavrilov, B.P. Makarov and Yu. Yu. Shveyko (Ref. 3: "Mekhanika i mashinostroyeniye" no. 3, Izd. AN SSSR, 1959) is described. Before the non-linear problem can be solved, the corresponding linear equations are analyzed and conditions of stability found. The approximate deformations are

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Thermal buckling of ...

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obtained for the case of one half-wave buckling with respect to both dimensions of the shell. A numerical example is given. There are 10 figures and 13 references: 10 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: J. M. Ashley and C. Zartarian: Piston theory - a new aerodynamic tool for the aeroelastician. Journ. Aer. Sci v. 23, no. 6, 1956; Y. C. Fung - The staic stability of a two-dimensional curved panel in a supersonic flow with an application to panel flutter. Journ. Aer. Sci. v. 21, no. 8, 1954; N. I. Hoff. Thermal buckling of supersonic wing panels. Journ. Aeron. Sci. v. 23, no. 11, 1956.

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33397
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D224/D304

10 6300

AUTHORS: Bolotin, V. V., Doctor of Technical Sciences, Professor, Makarov, B. P., Mishenkov, G. V. and Schveyko, Yu. Yu., Engineers

TITLE: An asymptotic method of investigating the spectrum of natural frequencies of elastic plates

SOURCE: Raschety na prochnost'; teoreticheskiye i eksperimental'nyye issledovaniya prochnosti mashinostroitel'nykh konstruktsiy. Sbornik statey. No. 6, Moscow, 1960, 231-253

TEXT: The authors consider the natural vibrations of a rectangular plate (with the sides a, b) of constant thickness. The general solution of wave equation near the edge x = 0 is looked for in the form

$$W(x, y) = X(x)\sin\frac{\pi(y - y_0)}{\lambda_y} \qquad (5)$$

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It is deduced that

$$X(x) = C_1 \sin \frac{\pi x}{\lambda_x} + C_2 \cos \frac{\pi x}{\lambda_x} + C_3 e^{-\frac{\pi x}{\lambda_x}\sqrt{1 + 2B_x^2}} \quad (8)$$

$B_x = \lambda_x/\lambda_y$. The first two terms correspond to the asymptotic representation for the internal zone; the third describes the dynamic edge effect. Estimation shows that the width of the zone of edge effect does not exceed 1/2 of the wavelength. For a plate with all edges rigidly fixed,

$$\operatorname{tg} \frac{\pi a}{2\lambda_x} = \frac{1}{\sqrt{1 + 2B_x^2}}, \quad \operatorname{tg} \frac{\pi b}{2\lambda_y} = \frac{1}{\sqrt{1 + 2B_y^2}} \quad (14)$$

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An asymptotic method ...

is obtained ($\beta_y = 1/\beta_x$), which is reduced to a single transcendental equation for β_x, and β_x is computed by successive approximation the initial value being the asymptotic one β_x = an/bm; the final quantity is the factor $\alpha = (a/\lambda_x)^2 + (a/\lambda_y)^2$. The authors give a table showing successive stages of computation of α for ten lowest frequencies of a square plate, and compare all values with Iguti's results obtained from a series solution satisfying all boundary conditions (six terms of the series taken). The largest difference between the results is 2.53% for m = n = 1. A table of values of α for 16 lowest frequencies of plates with a/b = 0.25 and a/b = 0.50 is also given. The equation for β_x of a plate elastically fixed along all edges is deduced. In this case both β_x and a/λ_x must be found by successive approximation; a graph of values of α as a function of $K = 2\pi D/ac$ (D being the cylindrical rigidity of the plate, c the rigidity factor for the edge) for 10 types of vibration is given. The case of an axially compressed plate is treated

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An asymptotic method ...

in the same way. Four cases are considered next, in which some sides are hinged and other sides rigidly fixed. Values of α computed for these cases for a square plate are tabulated and compared with those obtained by Ritz's method. The authors remark that some formulae for principal frequencies by Ritz's method, given in other publications, also in two reference manuals, contain errors. Equation for β_x of an orthotropic plate is also derived and a table of α for a square plate is given. There are 9 figures, 6 tables and 14 references: 11 Soviet-bloc and 3 non-Soviet-bloc. The reference to the English-language publication reads as follows: K. Friederichs, Asymptotic phenomena in mathematical physics. Bull. Americ. Math. Soc. 61, no. 6, 1955.

X

Card 4/4

BOLOTIN, V.V. (Moskva)

Variability of strength limits of brittle materials and its relation to the rated effect. Stroi.mekh.i rasch.soor. 2 no.4: 1-7 '60. (MIRA 13:7)

(Strength of materials)

[illegible])

89255
S/040/60/024/02/2[illegible]/03[illegible]

AUTHOR: Bolotin, V. V. (Moscow)

TITLE: The Equations of Instationary Temperature Fields in Thin Shells in Presence of Heat Sources

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. [illegible], pp. 361-363

TEXT: Starting from the variational principle for the heat-conductivity problem the author generalizes the thermoelastic equations of (Ref. 1, 2) to the case of instationary fields in shells in presence of heat sources. The thermoelastic after-effect is neglected; the shells are assumed to be thin with the constant thickness h; the radius of curvature of the shell is sufficiently large. Under these assumptions the following equations are obtained

$$(\;)\qquad \frac{\partial T_0}{\partial t} - \chi \Delta T_0 + \frac{2\kappa T_0}{c_p \rho h} = \frac{G}{c_p \rho h} + \frac{\kappa}{c_p \rho h}\left(T_1 - T_2\right)$$

$$(\;)\qquad \frac{\partial \Theta}{\partial t} - \chi \Delta \Theta + \left(\frac{12\chi}{h^2} + \frac{2\kappa}{c_p \rho h}\right)\Theta = \frac{12\, G_{xc}}{c_p \rho h^3} + \frac{6\kappa(T_1 - T_2)}{c_p \rho h^2}$$

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The Equations of Instationary Temperature Fields in Thin Shells in Presence of Heat Sources

Here it is $\Delta = \nabla^{\alpha} \Delta_{\alpha}$, ϱ the density, λ the coefficient of thermal conductivity, $\chi = \lambda / c_p \varrho$, k the coefficient of heat emission of the surface, t the time, T_0 the temperature of the central surface, T_+ and T_- the temperatures of the medium on the external and internal shell wall, θ the temperature gradient in direction of the normal to the central surface,

$$Q = \int_{-\lambda/2}^{\lambda/2} q\,dz \quad , \quad z_c = \frac{1}{Q} \int_{-\lambda/2}^{\lambda/2} z\,q\,dz$$

q the density of the heat sources. For the temperature in an arbitrary point of the shell it is put: $T = T_0 + z\,\theta$, where z is the coordinate in the direction of the normal of the central surface.

There are 3 references: 1 Soviet, 1 American and 1 German.

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics AS USSR)

SUBMITTED: December 26, 1959

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S/040/60/024/005/005/028
C111/C222

AUTHOR: Bolotin, V.V. (Moscow)

TITLE: Boundary Effect for Vibrations of Elastic Shells

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol.24, No.5, pp.831-842

TEXT: For excitations of high frequency the vibrations of thin shells can be described by asymptotic expressions. As it is well-known, these expressions, however, do not satisfy the boundary conditions and therefore they are worthless in the neighborhood of the boundary and the other lines of distortion. Since the destruction of thin-walled elements mostly appear in the neighborhood of the boundary or of the lines of distortion, the author investigates the possibility to find solutions which satisfy all boundary conditions and which, for a removal from the boundary, tend to the mentioned asymptotic expressions. In connection with this problem the author (Ref.1) has introduced the notion of the dynamic boundary effect; the deviation from the asymptotic expressions in the neighborhood of the boundary is said to be such a dynamic boundary effect. In (Ref.1) the author treated plates. In the present paper he develops the theory of the dynamic boundary effect in shells. He classifies the different effects for shells with

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Boundary Effect for Vibrations of Elastic Shells

a positive, vanishing and negative Gaussian curvature He gives the calculation of the effect from a solution known in the inner region. The representation is based on the theory of shells and on the notations of (Ref.3). The free elastic vibrations of a thin shell the lines of distortion γ of which (e.g. the boundary or the axis of the reinforcing rib) agree with the coordinate lines α = const or β = const, are described by

$$D\Delta\Delta w - \frac{1}{AB}\left(\frac{\partial}{\partial\alpha}\frac{B}{A}\frac{1}{R_2}\frac{\partial\varphi}{\partial\alpha} + \frac{\partial}{\partial\beta}\frac{A}{B}\frac{1}{R_1}\frac{\partial\varphi}{\partial\beta}\right) = q$$

$$(1.1)\qquad \frac{1}{Eh}\Delta\Delta\varphi + \frac{1}{AB}\left(\frac{\partial}{\partial\alpha}\frac{B}{A}\frac{1}{R_2}\frac{\partial w}{\partial\alpha} + \frac{\partial}{\partial\beta}\frac{A}{B}\frac{1}{R_1}\frac{\partial w}{\partial\beta}\right) = 0,$$

where w is the normal bending, φ is the function of the tangential stress, q is the normal load, h is the thickness of the shell, D is the cylindric rigidity, A and B are Lamé coefficients of the middle surface, R_1 and R_2 are the radii of curvature of the lines α = const

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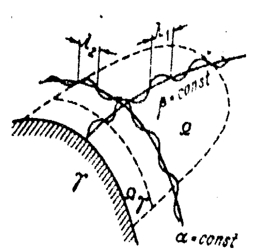
Boundary Effect for Vibrations of Elastic Shells

Fig. 1



and β = const, respectively, and Δ is the Laplace operator of the middle surface: $\Delta = \frac{1}{AB}\left(\frac{\partial}{\partial\alpha}\frac{B}{A}\frac{\partial}{\partial\alpha} + \frac{\partial}{\partial\beta}\frac{A}{B}\frac{\partial}{\partial\beta}\right)$. The author seeks solutions of (1.1) in the neighborhood Ω of γ; if Ω is small then A $\approx$ const, B $\approx$ const, R_1 = const, R_2 = const. Let $Ad\alpha = dx_1$, $Bd\beta = dx_2$. Let γ coincide with $x_1 = 0$. For the sought solution the author finds

$$(1.8)\qquad \psi_\gamma(x_1, x_2) = \Psi(x_1 \sin k_2(x_2 - x_2^0)),$$

where $\Psi = Ce^{sx_1}$, C = const., s can be obtained from

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Boundary Effect for Vibrations of Elastic Shells

$$\Delta(s^2) = s^8 - 4k_2^2 s^6 + \left(6k_2^4 + \frac{Eh}{R_2^2 D} - \frac{\gamma h \omega^2}{gD}\right)s^4 -$$

(1.10)
$$-\left(4k_2^6 + \frac{2Ehk_2^2}{R_1 R_2 D} - 2k_2^2 \frac{\gamma h \omega^2}{gD}\right)s^2 + k_2^8 + \frac{k_2^4 Eh}{R_1^2 D} - k_2^4 \frac{\gamma h \omega^2}{gD} = 0.$$

Here $k_1 = \frac{\pi}{\lambda_1}$, $k_2 = \frac{\pi}{\lambda_2}$, λ_1 and λ_2 cf. figure 1, γ is the specific weight of the shell, ω is a real frequency given by

(1.7)
$$\omega^2 = \frac{gD}{\gamma h}\left[(k_1^2+k_2^2)^2 + \frac{Eh}{D}\,\frac{(k_1^2/R_2+k_2^2/R_1)^2}{(k_1^2+k_2^2)^2}\right].$$

The equation (1.10) is the principal result of the present paper and is the starting point for the investigation of the numerous possible individual cases resulting from the discussion of the solutions of (1.10)

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Boundary Effect for Vibrations of Elastic Shells

There are 5 figures, 1 table and 4 references: 3 Soviet and 1 German.

[Abstracter's note: (Ref.1) is a paper of the author in Inzh.Sborn., 1960, Vol.31. (Ref.3) concerns A.L.Gol'denveyzer, Theory of Thin Elastic Shells, 1953.]

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics of the Academy of Sciences USSR)

SUBMITTED: January 14, 1960

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S/508/60/028/000/005/022
D237/D305

AUTHOR: Bolotin, V.V. (Moscow)

TITLE: Non-linear flutter of panels and shells

PERIODICAL: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk. Inzhenernyy sbornik, v. 28, 1960, 55 - 75

TEXT: The author investigates non-linear flutter of flat and curved panels in high supersonic velocity flow, The basic non-linear formula used is

$$p = p_\infty \left(1 + \frac{\varkappa - 1}{2} \frac{v_z}{a_\infty}\right)^{\frac{2\varkappa}{\varkappa - 1}}. \qquad (1.1)$$

An elastic curved panel (Fig. 1), is considered, streamlined by a supersonic flow with initial velocity U in an x_0 direction, and its curvature, is assumed to be small enough for the middle of its surface to have approximately metric characteristics. Basic hypotheses

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of non-linear theory of shells are used and the Kirchhoff-Love hypothesis is assumed. Bending of the panel is assumed proportional to its thickness h ≪ a and b, and tangential interial forces are neglected. If x, y are curvilinear coordinates along the lines of curvature of a non-deformed surface, k_x and k_y its principal curvatures, w(x, y, t) = normal deflection, the function of axial stress $\Phi(x, y, t)$ is defined by

$$N_x = \frac{\partial^2 \Phi}{\partial y^2}, \quad N_y = \frac{\partial^2 \Phi}{\partial x^2}, \quad N_{xy} = -\frac{\partial^2 \Phi}{\partial x \partial y} \qquad (2.1)$$

and if there exists a stationary temperature field linear w.r. to the thickness and defined by $T = T_0(x, y) + z\theta(x, y)$, then

$$\left.\begin{aligned} &D\nabla^2\nabla^2 w + \alpha(1+\mu)D\nabla^2\theta = \\ &= \left(k_x + \frac{\partial^2 w}{\partial x^2}\right)\frac{\partial^2\Phi}{\partial y^2} + \left(k_y + \frac{\partial^2 w}{\partial y^2}\right)\frac{\partial^2\Phi}{\partial x^2} - 2\frac{\partial^2 w}{\partial x\partial y}\frac{\partial^2\Phi}{\partial x\partial y} + q,\end{aligned}\right\} \qquad (2.2)$$

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$$\left.\begin{aligned} &\frac{1}{Eh}\nabla^2\nabla^2\Phi + \alpha\nabla^2 T_0 = \\ &= \left(\frac{\partial^2 w}{\partial x\,\partial y}\right)^2 - \frac{\partial^2 w}{\partial x^2}\frac{\partial^2 w}{\partial y^2} - k_x\frac{\partial^2 w}{\partial y^2} - k_y\frac{\partial^2 w}{\partial x^2}. \end{aligned}\right\} \quad (2.3)$$

where D - cylindrical strength, E - modulus of elasticity, μ - Poisson's coefficient, q - normal component of the load consisting of inertial forces, aerodynamic pressure and damping forces

$$q = -\rho_0 h\frac{\partial^2 w}{\partial t^2} - 2\rho_0 h\varepsilon\frac{\partial w}{\partial t} + p_0 - p \quad (2.4)$$

ρ_0 - density of the panel, ε - damping coefficient, p_0 - internal pressure, α - coefficient of thermal expansion. Turbulent pressure p is obtained from (1.1) by the substitution

$$v_z \approx \frac{\partial w}{\partial t} + U\frac{\partial(w_0 + w)}{\partial x_0}, \quad (2.5)$$

and on expansion into series up to 3rd order, it becomes

$$p \approx p_\infty + \varkappa p_\infty M \frac{\partial (w_0 + w)}{\partial x_0} + \frac{\varkappa(\varkappa+1) p_\infty M^2}{4} \left[\frac{\partial (w_0 + w)}{\partial x_0}\right]^2 + \frac{\varkappa(\varkappa+1) p_\infty M^3}{12} \left[\frac{\partial (w_0 + w)}{\partial x_0}\right]^3. \tag{2.6}$$

The solution is derived in two stages: 1) Problem of thermal deformation of the panel; 2) Problem of flutter of the deformed panel. Let $w = w_T(x, y)$, $\Phi = \Phi_T(x, y)$ be a stationary solution of (2.2) and (2.3). It is assumed that $w = w_T(x, y) + w_F(x, y, t)$; $\Phi = \Phi_T(x, y) + \Phi_F(x, y, t)$ and a known stationary solution $w = w_T(x, y)$, $\Phi = \Phi_T(x, y)$. Boundary conditions on the contour are

$$\overline{N_x^F} = c_x \overline{\Delta_x^F}, \quad \overline{N_y^F} = c_y \overline{\Delta_y^F}, \quad \overline{N_{xy}^F} = 0. \tag{3.7}$$

which together with

$$\left.\begin{aligned}\frac{\partial u_F}{\partial x} &= \frac{1}{Eh}\left(N_x^F - \mu N_y^F\right) + k_x w_F - \frac{1}{2}\left(\frac{\partial w_F}{\partial x}\right)^2 - \frac{\partial w_T}{\partial x}\frac{\partial w_F}{\partial x},\\ \frac{\partial v_F}{\partial x} &= \frac{1}{Eh}\left(N_y^F - \mu N_x^F\right) + k_y w_F - \frac{1}{2}\left(\frac{\partial w_F}{\partial y}\right)^2 - \frac{\partial w_T}{\partial y}\frac{\partial w_F}{\partial y}.\end{aligned}\right\} \qquad (3.8)$$

give

$$\overline{\Delta_k^F} = -\frac{1}{b}\int_0^b dy\int_0^a \frac{\partial u_F(x, y)}{\partial x}dx, \quad \overline{\Delta_y^F} = -\frac{1}{a}\int_0^a dx\int_0^b \frac{\partial v_F(x, y)}{\partial y}dy, \qquad (3.9)$$

giving boundary conditions in terms of $w_F(x, y, t)$, $\Phi_F(x, y, t)$. Next it is assumed that first part of the problem is solved, i.e. $w_T(x, y)$ and $\Phi_T(x, y)$ are known. As thermal distortion is represented by a series in $\varphi_j(x, y)$ dynamic distortion is also sought as

$$w_F(x, y, t) = \sum_{j=1}^{n} f_j^F(t)\,\varphi_j(x, y). \qquad (4.1)$$

which should result in a set of ordinary differential equations. The case of flat non-distorted panel is considered next. If

$$\left.\begin{aligned} &\frac{d^2\zeta_1}{d\tau^2} + g\frac{d\zeta_1}{d\tau} + \zeta_1 - \frac{2}{3}\nu K\zeta_2 = \Psi_1(\zeta_1, \zeta_2, \nu), \\ &\frac{d^2\zeta_2}{d\tau^2} + g\frac{d\zeta_2}{d\tau} + \omega_2^2\zeta_2 + \frac{2}{3}\nu K\zeta_1 = \Psi_2(\zeta_1, \zeta_2, \nu). \end{aligned}\right\} \qquad (6.1)$$

then for a corresponding linear system

$$\nu_* = \frac{3}{4}\frac{\omega_2^2 - 1}{K}\sqrt{1 + \frac{2(\omega_2^2+1)g^2}{(\omega_2^2-1)^2}}, \qquad (6.2)$$

and

$$\left.\begin{aligned} &\varphi_{11} = \cos\tau_1 + O(g^2), \\ &\varphi_{21} = -\cos\tau_1 - g\chi\sin\tau_1 + O(g^2), \\ &\varphi_{12} = \sin\tau_1 + O(g^2), \\ &\varphi_{22} = -\sin\tau_1 + g\chi\cos\tau_1 + O(g^2), \end{aligned}\right| \qquad (6.3)$$

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where

$$\chi = \frac{\sqrt{2}\sqrt{\omega_2^2+1}}{\omega_2^2-1}.$$

Periodicity conditions are

$$(1-\omega_0^2+ig\omega_0)R_{21}^{(s)}-\frac{2}{3}\nu_* KR_{11}^{(s)}=0, \tag{6.4}$$

where $R_{21}^{(s)}$ and $R_{11}^{(s)}$ - Fourier coefficients for $\Gamma_1^{(s)}$ and $\Psi_2^{(s)}$ when exp $(i\tau_1)$ while when

$$\Psi_1^{(s)} = P_1^{(s)}\cos\tau_1 + Q_1^{(s)}\sin\tau_1 + \dots,$$
$$\Psi_2^{(s)} = P_2^{(s)}\cos\tau_1 + Q_2^{(s)}\sin\tau_1 + \dots,$$

$$\left.\begin{aligned} P_1^{(s)} + P_2^{(s)} - 2g\chi Q_2^{(s)} = 0, \\ Q_1^{(s)} + Q_2^{(s)} + 2g\chi P_2^{(s)} = 0. \end{aligned}\right\} \tag{6.5}$$

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is obtained. For a flat non-distorted panel one has

$$\left.\begin{aligned} \Psi_1(\zeta_1, \zeta_2, \nu) &= \nu^2 K \left[\frac{2}{9}(\varkappa+1)\zeta_1^2 + \frac{56}{45}(\varkappa+1)\zeta_2^2 + \right. \\ &\left. + \nu\zeta_2(b_{11}\zeta_1^2 + b_{12}\zeta_2^2)\right] + S\zeta_1(c_{11}\zeta_1^2 + c_{12}\zeta_2^2), \\ \Psi_2(\zeta_1, \zeta_2, \nu) &= \nu^2 K \left[\frac{16}{45}(\varkappa+1)\zeta_1\zeta_2 + \right. \\ &\left. + \nu\zeta_1(b_{21}\zeta_1^2 + b_{22}\zeta_2^2)\right] + S\zeta_2(c_{21}\zeta_1^2 + c_{22}\zeta_2^2). \end{aligned}\right\} \quad (6.6)$$

and periodic solution

$$\left.\begin{aligned} \zeta_1 &= A\cos\tau_1 + \eta\zeta_1^{(1)} + \eta^2\zeta_2^{(2)} \ldots, \\ \zeta_2 &= A(\cos\tau_1 + g_{\nu}\sin\tau_1) + \eta\zeta_2^{(1)} + \eta^2\zeta_2^{(2)} + \ldots, \end{aligned}\right\} \quad (6.7)$$

Amplitude of 1st approximation is found to be

$$A = \frac{4}{3}\sqrt{\frac{(1 - \nu_*)K}{Sc_0 - \nu_*^3 Kb_0}}, \quad (6.8)$$

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where $b_0 = b_{21} + b_{22} - b_{11} - b_{12}$, $c_0 = c_{21} + c_{22} -$

$$- c_{11} - c_{12}. \qquad (6.9)$$

The author then considers (6.8) with respect to the behavior of the system near the instability region, and solves a numerical problem as an example. There are 6 figures, and 19 references: 12 Soviet-bloc and 7 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: H.C. Nelson, H.J. Cunningham, Theoretical investigation of flutter of two-dimensional flat panels with one surface exposed to supersonic potential flow. NACA Rep. No. 1280, 1956; J.W. Miles, Supersonic flutter of a cylindrical shell, J. Aeron. Sci. vol. 24, no. 2, 1957, vol. 25, no. 5, 1958; H.G. Morgan, H.L. Runyan, V. Huckel, Theoretical considerations of flutter at high Mach numbers, J. Aeron. Sci. vol. 26, no. 6, 1958; Y.C. Fung, On two dimensional panel flutter, J. Aeron. Sci., vol. 25, no. 3, 1958.

SUBMITTED: July 9, 1959

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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204400017-6

44815

S/044/63/000/001/025/053
A060/A000

AUTHOR: Bolotin, V.V.

TITLE: Asymptotic method in the theory of oscillations of elastic plates and shells

PERIODICAL: Referativnyy zhurnal, Matematika, no. 1, 1963, 62, abstract 1B295 (Tr. Konferentsii po teorii plastin i obolochek, 1960, Kazan', 1961, 21 - 26)

TEXT: The author formulates the problem of finding the eigenvalues λ and the characteristic functions φ_β, satisfying in the region $0 \leqslant x_\alpha \leqslant a_\alpha$ (α = 1, ..., n) the system of differential equations

$$\sum_{\gamma=1}^{n} L_{\beta\gamma} (\varphi_\gamma) - \lambda \sum_{\gamma=1}^{n} M_{\beta\gamma} (\varphi_\gamma) = 0 \ (\beta = 1, \ldots, n) \qquad (1)$$

and the boundary conditions:

$$N_{\alpha\gamma} (\varphi_1, \ldots, \varphi_n | 0) = 0; \ N_{\alpha\gamma} (\varphi_1, \ldots, \varphi_n | a_\alpha) = 0$$
$$\begin{pmatrix} \alpha = 1, \ldots, n \\ \gamma = 1, \ldots, p \end{pmatrix}. \qquad (2)$$

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Here $L_{\beta\gamma}$, $M_{\beta\gamma}$, $N_{\alpha\gamma}$ are self-adjoint linear differential operators. The total order of the system is 2p. A boundary problem is called a problem with almost-separable variables if: 1) Under appropriate boundary conditions (2) it possesses so-called degenerate solutions

$$\varphi_\beta = \prod_{\alpha=1}^{m} \psi_{\beta\alpha}(x_\alpha) \quad (\beta = 1, \ldots, n). \tag{3}$$

2) The system (1) admits of a solution of the form

$$\varphi_\beta = \Phi_{\beta\alpha_0}(x_{\alpha_0}) \prod_{\alpha\neq\alpha_0}^{m} \psi_{\beta\alpha}(x_\alpha) \quad \begin{pmatrix} \beta = 1, \ldots, n \\ \alpha_0 = 1, \ldots, m \end{pmatrix}. \tag{4}$$

3) The substitution of (4) in the boundary conditions (2) corresponding to $\alpha = \alpha_0$ transforms them into conditions containing the $\Phi_{\beta\alpha_0}$ only. The asymptotic method of constructing characteristic functions consists in that by means of various functions of the form (4) the boundary conditions (2) are satisfied for $x_{\alpha_0} = 0$ and $x_{\alpha_0} = a_{\alpha_0}$, and thereupon the solutions are "glued together". As one recedes from the boundaries of the region, the obtained asymptotic solu-

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tions get closer to the original ones. As an example, the author considers the problem of the natural oscillations of an isotropic sloping shell based on a rectangular contour.

O.I. Panich

[Abstracter's note: Complete translation]

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BOLOTIN, V.V. (Moskva)

Life of structures under quasi-stationary stress conditions.
Insh.sbor. 29:33-36 '60. (MIRA 13:10)
(Strength of materials)

BOLOTIN, V.V. (Moskva)

Edge effect in oscillations of elastic shells. Prikl. mat. i mekh. 24 no.5:831-842 S - O '60. (MIRA 14:3)

1. Institut mekhaniki AN SSSR.
(Elastic plates and shells--Vibration)

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S/122/60/000/011/006/020
A161/A127

AUTHOR: Bolotin, V. V., Professor, Doctor of Technical Sciences

TITLE: Calculation of strength for random cases of alternate stresses whose amplitudes follow Pearsons's law of distribution

PERIODICAL: Vestnik mashinostroyeniya, no. 11, 1960, 32 - 36

TEXT: In the present article formulas are derived for the calculation of the safety factor for random cases of alternate stresses in machine parts, intended for a wide class of statistical distributions. Many parts work under such stress conditions with amplitudes of random values which follow certain statistical distributions. Based on the hypothesis of summarizing the fatique failures, it is recommended to perform the calculation of such parts according to S. V. Serensen, V. P. Kogayev, L. A. Kozlov and R. M. Shneyderovich (Ref. 1: Nesushchaya sposobnost' i raschety detaley mashin [Load-carrying capacity and calculation of machine parts], Mashgiz, 1954) and D. N. Reshetov (Ref. 2: Raschet detaley stankov [Calculation of machine tool parts], Mashgiz, 1955). According to Ref. 2 it is possible to introduce for the stress σ the equation

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$$\sigma_{np} = \sigma_{-1} \sqrt[m]{\frac{N}{N_n}} \tag{5}$$

and for the safety factor k the equation

$$k = \frac{\sigma_{-1}}{\sigma_{np}} = \sqrt[m]{\frac{N_n}{N}} \tag{6}$$

Where σ = amplitude, n = number of cycles of the amplitude σ, (a symmetrical cycle assumed), N = the limit number of cycles, p (σ) = the probability density, σ_{-1} = the endurance limit on base N; N_o and m are empirical constants for given carbon steel grades. These formulas may also be applied to asymmetrical cycles and intricate stress conditions. When deriving the basic formula it is necessary to overcome the difficulty of obtaining the distribution function p (σ) and the corresponding integral. It is convenient to use Pearson's χ^2 distribution pattern. The calculated stress values are plotted in Figure 2, illustrating the relation between the distribution and the values of the α parameters. According to various values for α which, as well as σ_k is selected according to the parame-

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ters of an empirical distribution curve, we obtain with $\alpha = 1$ a distribution whose ordinates are equal to the doubled ordinates of the positive branch of the central Gauss distribution, with $\alpha = 2$ Rayleigh's distribution, and with $\alpha = 3$ the known Maxwell distribution, etc. By these procedures an expanded class of empirical distributions may be calculated. Through an integral, represented by an incomplete gamma-function, expressed through the tabulated function of Pearson's χ^2-distribution function, formulas (13) and (14) are obtained:

$$N_n = \frac{N_0 x_0^m \Psi(\alpha)}{\Psi(m + \alpha) P(x_0^2, m + \alpha)} \tag{13}$$

$$k = x_0 \sqrt{\frac{N_0}{N} \frac{\Psi(\alpha)}{\Psi(m + \alpha) P(x_0^2, m + \alpha)}} \tag{14}$$

Formula (14) with $\alpha = 2$ was obtained first by the author (Ref. 4: Ob otsenke dol-

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govechnosti pri statsionarnykh sluchaynykh nagruzkakh [Estimation of life endurance for stationary random loads], Izv. vyssh. shkoly. Mashinostroyeniye, No. 8, 1959). In addition to the basic formula several approximated formulas are developed for the calculation of N_n (number of cycles n during life endurance N) and k (safety factor). A numerical example, taken from the book quoted under Ref. 1, is given for tangential stress amplitudes occurring in the differential axle of the C-4 (S-4) harvesting combine. The distribution obtained is close to normal. The number of cycles of pulsating stresses during the life $N = 5.25 \cdot 10^6$; the yield limit $\sigma_T = 75$ kg/mm^2 for the differential axle made of 40X (40Kh) steel; the torsion endurance limit $\tau_{-1} = 7.3$ kg/mm^2; the accepted fatigue curve parameters: $N_0 = 3 \cdot 10^6$ and m = 6. In view of insufficient experiment data on asymmetric cycle conditions, the safety factor is calculated from the stress amplitudes (see Ref. 1). Taking into consideration the computed value for

$$x_0 = \frac{\tau_{-1}}{\tau_k} = \frac{7.3}{2.84} = 2.57$$

and for the given case $\alpha = 1$, we obtain by substituting the numerical values in

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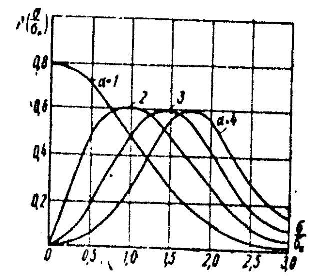
formulas (13) and (14) for

$$N_n = \frac{3 \cdot 10^6 \cdot 2.75^6 \cdot 1.25}{18.8 \cdot 0.473} = 121 \cdot 10^6; \quad k = \sqrt[6]{\frac{121 \cdot 10^6}{5.25 \cdot 10^6}} = 1.69$$

The considerable difference between the value for k obtained in Ref. 1, k = 1.8, compared to 1.69 is explained by the fact that there the distribution curve has been discontinued at the value τ_{max} = 10 kg/mm^2. Utilizing other approximation formulas, the following values have been obtained: N = 152 · 10^6; k = 1.75; underrated: N = 57.5 · 10^6; k = 1,49; overrated: N = 261 · 10^6; k = 1.92. There are 5 figures and 4 Soviet-bloc references.

Figure 2



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APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204400017-6

BOLOTIN, Vladimir Vasil'yevich, doktor tekhn. nauk, prof.; SNITKO, I.K., doktor tekhn. nauk, prof., nauchnyy red.; BUDARINA, E.M., red.; GOL'BERG, T.M., tekhn. red.

[Statistical methods in structural mechanics] Statisticheskie metody v stroitel'noi mekhanike. Moskva, Gos. izd-vo lit-ry po stroit., arkhit. i stroit. materialam, 1961. 201 p. (MIRA 14:6)

(Statistical mechanics) (Structures, Theory of)

PHASE I BOOK EXPLOITATION SOV/5937

Bolotin, Vladimir Vasil'yevich

Nekonservativnyye zadachi teorii uprugoy ustoychivosti (Nonconservative Problems in the Elastic Stability Theory) Moscow, Fizmatgiz, 1961. 339 p. 7000 copies printed.

Ed.: I. K. Snitko; Tech. Ed.: Ye. A. Yermakova.

PURPOSE: This book is intended for engineers and scientists of industry and research institutes working in the field of machine building and aircraft construction. It may also be useful to students at schools of higher education.

COVERAGE: The book is devoted to the study of elastic systems under the action of nonconservative forces. As is known, these systems cannot be calculated by the usual methods of the elastic stability theory based on the consideration of the states of equilibrium. One chapter deals with problems of the stability of elastic systems in high-velocity flows of gas. Special attention is given to the

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supersonic flutter of elastic plates and shells. Several problems are examined in a nonlinear condition, which makes it possible to investigate the system after the loss of elasticity. The book is based mainly on the author's research work in this field. E. L. Poznyak, L. V. Yepishev, B. P. Makarov, Yu. Yu. Shveyko, G. V. Mishenkov, and Yu. V. Gavrilov are mentioned as having supplied some of the experimental results and calculations. The author thanks A. I. Lur'ye. References are in the form of footnotes.

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BOLOTIN, V. V. PHASE I BOOK EXPLOITATION SOV/6206

Konferentsiya po teorii plastin i obolochek. Kazan', 1960.

Trudy Konferentsii po teorii plastin i obolochek, 24-29 oktyabrya 1960. (Transactions of the Conference on the Theory of Plates and Shells Held in Kazan', 24 to 29 October 1960). Kazan', [Izd-vo Kazanskogo gosudarstvennogo universiteta] 1961. 426 p. 1000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Kazanskiy filial. Kazanskiy gosudarstvennyy universitet im. V. I. Ul'yanova-Lenina.

Editorial Board: Kh. M. Mushtari, Editor; F. S. Isanbayeva, Secretary; N. A. Alumyae, V. V. Bolotin, A. S. Vol'mir, N. S. Ganiyev, A. L. Gol'denveyzer, N. A. Kil'chevskiy, M. S. Kornishin, A. I. Lur'ye, G. N. Savin, A. V. Sachenkov, I. V. Svirskiy, R. G. Surkin, and A. P. Filippov. Ed.: V. I. Aleksagin; Tech. Ed.: Yu. P. Semenov.

PURPOSE: The collection of articles is intended for scientists and engineers who are interested in the analysis of strength and stability of shells.

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Transactions of the Conference (Cont.) SOV/6206

COVERAGE: The book is a collection of articles delivered at the Conference on Plates and Shells held in Kazan' from 24 to 29 October 1960. The articles deal with the mathematical theory of plates and shells and its application to the solution, in both linear and nonlinear formulations, of problems of bending, static and dynamic stability, and vibration of regular and sandwich plates and shells of various shapes under various loadings in the elastic and plastic regions. Analysis is made of the behavior of plates and shells in fluids, and the effect of creep of the material is considered. A number of papers discuss problems associated with the development of effective mathematical methods for solving problems in the theory of shells. Some of the reports propose algorithms for the solution of problems with the aid of electronic computers. A total of one hundred reports and notes were presented and discussed during the conference. The reports are arranged alphabetically (Russian) by the author's name.

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BOLOTIN, V.V.(Moskva)

Dynamic boundary effect caused by elastic vibrations of plates. Inzh. sbor. 31:3-14 '61. (MIRA 14:6)
(Elastic plates and shells--Vibration)

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AUTHOR: Bolotin, V.V.

TITLE: Dynamic problems of thermoelasticity in plates and shells in presence of radiation

PERIODICAL: Referativnyy zhurnal, Mekhanika, Svodnyy tom. no. 8V, 1962, 12, abstract 8V87 (Tr. Konferentsii po teorii plastin i obolochek, 1960, Kazan', 1961, 27-32)

TEXT: The problem of heat transfer in the presence of radiation and the respective dynamic problem of thermoelasticity as applied to plates and shells is considered. A hypothesis, similar to the Kirchhof-Lyav hypothesis for shells is introduced into the solution of the heat transfer equation. It is assumed that the temperature T at any point in the shell may be determined by

$$T = T_0 (x^1, x^2) + x^3 \theta (x^1, x^2)$$

where x^1 and x^2 are curved coordinates of the mid-surface, x^3 is the coordinate taken normal to the mid surface, T_0 is the temperature of the mid surface and θ is the temperature gradient along the normal to the mid-surface. A differential equation is derived for T_0 and θ with the assumption that there is convective

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heat transfer between the shell and the surrounding medium, and that there are heat sources. These equations are simultaneously integrated with the equations for thermoelasticity in presence of members of inertia for the following case: an infinite plate of constant thickness, stationary at t < o is submitted to radiation, at time t = o, with its intensity decreasing according to an exponential law, and the density of the source changing with the radius, according to the Gaussian law. The problem is solved using Henkel's transformation. The transfer formulae are given in an integral form.

[Abstracter's note: Complete translation.]

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A060/A000

AUTHOR: Bolotin, V.V.

TITLE: Asymptotic method of investigating eigenvalue problems for rectangular domains

PERIODICAL: Referativnyy zhurnal, Matematika, no. 12, 1962, 53, abstract 12B239 (In collection "Probl. mekhaniki sploshn. sredy", Moscow, AN SSSR, 1961, 60 - 72)

TEXT: An approximate method is proposed for determining the eigenvalues for the selfconjugate boundary problem

$$L\varphi - \lambda M\varphi = 0, \qquad (1)$$

where L and M are two differential operators in the function space of the m variables $x_1, \ldots, x_m$ with constant coefficients, containing only the even derivatives and being of the order 2n and 2 (n - 1), respectively. Equation (1) is considered in a rectangular domain $0 \leqslant x_\alpha \leqslant 1$, $\alpha = 1, \ldots, m$, where on the boundary homogeneous boundary conditions are specified, defined by means of differential operators with constant coefficients. The solution of the problem is

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required in the form of combinations of trigonometric and exponential functions, which are taken to be different in the neighborhood of the boundary and in the interior part of the domain. The eigenvalues are found in the course of joining these solutions. The method is illustrated by examples.

L.D. Faddeyev

[Abstracter's note: Complete translation]

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BOLOTIN, V.V. (Moskva)

Applying the law of plane sections to the determination of aerodynamic forces acting on vibrating shells. Izv. An SSSR. Otd. tekh.nauk.Mekh. i mashinostr. no. 1:159-162 Ja-F '61. (MIRA 14:2)

(Aerodynamics, Supersonic)
(Elastic plates and shells)

BOLOTIN, V.V. (Moskva); NOVICHKOV, Yu.N. (Moskva)

Buckling and steady flutter of thermally compressed panels in a supersonic flow. Inzh.zhur. 1 no.2:82-96 '61. (MIRA 14:12)

1. Institut mekhaniki AN SSSR.
(Aerodynamics, Supersonic) (Flutter (Aerodynamics))

BOLOTIN, V.V. (Moskva)

Generalizing the asymptotic method for the solution of problems on eigenvalues for rectangular areas. Inzh.zhur.1 no.3:86-92 '61. (MIRA 15:2)

1. Institut mekhaniki AN SSSR.
(Elastic plates and shells--Vibration)

VARVAK, P.M.; KIRIYENKO, V.I.; CHUDNOVSKIY, V.G.; KRYLOV, V.K.; BRAUDE, Z.I.; EKIMYAN, V.A.; IVANOV-DYATLOV, A.I.; FRANOV, P.I.; ASHAKOV, A.Ye.; BERDICHEVSKIY, N.M.; IZAKSON, S.I.; KOZLOV, V.[illegible]; KOLESNIK, K.S.; KUYDICH, S.A.; SVERDLOV, A.I.; SIMON, Yu.A.; SHEYNFAYN, S.R., BOLOTIN, V.V.; GOL'DENBLAT, I.I.

Book reviews and bibliography. Stroi. mekh. i rasch. soor. 3 no.6:46-50 '61. (MIRA 15:4)

(Bibliography--Structures, Theory of)

BOLOTIN, V.V. (Moskva)

Problem of bridge vibrations caused by the action of moving loads. Izv. AN SSSR. Otd.tekh.nauk.Mekh i mashinostr. no.4:109-115 Jl-Ag '61. (MIRA 14:8)

(Bridges—Vibration)

BOLOTIN, V.V., doktor tekhn.nauk, prof.; AVINOVITSKIY, I.A., inzh.;
BLAGONADEZHIN, V.L., inzh.; KHROMCHENKO, G.Ye.

Choice of the tower span distances in stringing aluminum sheathed power cables. Elektrichestvo no.5:9-12 My '61.
(MIRA 14:9)

(Electric lines--Overhead)

BOLOTIN, V.V., doktor tekhn.nauk, prof.

Strength and cumulative damage under random loading. Rasch.na prochn. no.7:23-49 '61. (MIRA 14:11)
(Strength of materials)

BOLOTIN, V.V.(Moskva)

Inherent oscillations of a rectangular elastic parallelepiped.
Prikl. mat. i mekh. 25 no.1:155-158 Ja-F '61. (MIRA 14:6)
(Elastic solids--Vibration)

BOLOTIN, V.V. (Moskva)

Effect of a momentless stressed state on the spectra of natural vibrations of thin elastic shells. Izv.AN SSSR.Otd.tekh.nauk.-Mekh. i mashinostr. no.4:52-60 Jl-Ag '62. (MIRA 15:8)
(Elastic plates and shells--Vibration)

BOLOTIN, V.V., doktor tekhn.nauk, prof.

Some problems in the theory of brittle fracture. Rasch.na prochn. no.8:36-52 '62. (MIRA 15:8)

(Metals--Brittleness)

BOLOTIN, V.V. (Moskva)

Behavior of heated plates and shallow shells in a gas flow.
Inzh.zhur. 2 no.3:119-125 '62. (MIRA 15:8)

1. Institut mekhaniki AN SSSR.
(Elastic plates and shells) (Aerodynamics, Supersonic)

BOLOTIN, V.V. (Moskva)

Combination of random loads acting on a structure. Stroi. mekh. i rasch. soor. 4 no.2:1-5 '62. (MIRA 15:5)
(Structures, Theory of)

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BOLOTIN, V.V.

Correction to the article "Boundary effect in vibrations of elastic shells". Prik. mat. i mekh. 26 no.2:392 Mr-Ap '62.
(MIRA 15:4)

(Elastic plates and shells--Vibration)

S/030/62/000/001/011/011
B104/B102

AUTHOR: Bolotin, V. V., Professor

TITLE: Development of the theory of plates and shells

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 1, 1962, 136 - 138

TEXT: In Russia, there are efficient scientific schools of the theory of plates and shells in Moscow, Leningrad, Kiyev, and Kazan'. Scientific collectives in Yerevan, Novosibirsk, and L'vov have been very successful. At the 10th International Congress on Applied Mechanics in August, 1961 in Italy, the Soviet delegation delivered 28 reports, 8 of which dealt with the theory of plates and shells. The Nauchnyy sovet Akademii nauk SSSR po problemy "Nauchnyye osnovy prochnosti i plastichnosti" (Scientific Council of the Academy of Sciences USSR for the Problem "Scientific Bases of Strength and Plasticity"), the Institut mekhaniki (Institute of Mechanics), the Institut mashinovedeniya i avtomatiki Akademii nauk Ukrainskoy SSR (Institute of the Science of Machines and Automation of the Academy of Sciences Ukrainskaya SSR), and the L'vovskiy universitet (L'vov University) held a conference on the theory of plates and shells

Card 1/2

Development of the theory ...

S/030/62/000/001/011/011
B104/B102

in L'vov on September 15 - 21, 1961. Kh. M. Mushtari studied the solu-
tion of nonlinear problems, A. L. Gol'denveyzer spoke about asymptotic
methods in the shell theory. A report by A. V. Pogorelov on trans-criti-
cal deformations of thin shells aroused a lively discussion. G. N. Savin,
A. F. Kovalenko, and N. A. Kil'chevskiy reported on great progress of the
theory achieved in the Ukraine. In the Section of Dynamics, a report by
N. A. Alumyae on conical shells of revolution met with special attention.
M. F. Dimentberg dealt with vibrations of plates and shells under load.
G. S. Shapiro suggested the solution of dynamic problems beyond elastici-
ty. In the Section of Stability of Plates and Shells, V. I. Feodos'yev
dealt with the problem of axisymmetric elasticity equilibrium for spheri-
cal shells. B. P. Makarov described a statistical method of solving non-
linear stability problems for determining the distribution of critical
forces in real shells under quasistatic loads. V. M. Boncharenko applied
the theory of multidimensional Markov processes to analyze the stability
of shells with random shocks. The Section of Structural Mechanics of Pla-
tes and Shells was first established at this Conference. 60 reports were
delivered. Special problems of machine construction, over- and under-
ground structures, aviation, and similar fields were dealt with.
Card 2/2

S/124/63/000/002/033/052
D234/D308

AUTHOR: Bolotin, V.V.

TITLE: Combination of random loads acting on a structure

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 2, 1963, 21, abstract 2V139 (Stroit. mekhan. i raschet sooruzh., no. 2, 1962, 1-5)

TEXT: The author considers the problem of a structure subjected to several loads of different form, consisting in normally distributed quasi-stationary random functions of time. It is assumed that the reaction of the structure can be characterized by a parameter z which is a linear function of load parameters. The author formulates the problem of determining the probability $P(z > z_* \mid 0 \leqslant t \leqslant T)$ of an event which consists in z exceeding the limit value z_* at least once in the time interval between 0 and T. The case of infrequent overloads is especially interesting, the probability of a single excess being much greater than the probability of repeated excesses. For this case, the author gives an approximate

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Combination of random loads ... S/124/63/000/002/033/052
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relation between the unknown probability and the mean number of excesses over a given level; the latter is determined by Rays' formula. In the case of stationary loads, a relation for P is obtained in a finite form; it contains the effective loading period T_o. A numerical example is given showing that T_o can substantially differ from the minimum period.
[Abstracter's note: Complete translation]

Card 2/2

S/879/62/000/000/002/088
D234/D308

AUTHOR: Bolotin, V. V. (Moscow)

TITLE: Modern trends in dynamics of plates and shells

SOURCE: Teorya plastin i obolochek; trudy II Vsesoyuznoy konferentsii, L'vov, 15-21 sentyabrya 1961 g. Kiev, Izd-vo AN USSR, 1962, 16-32

TEXT: A review article dealing with spectra of natural vibrations due to random forces or impacts, natural oscillations in a gas stream, vibrations of plates and shells interacting with a dense liquid, dynamic problems of thermoelasticity, parametric vibrations. Some unpublished results obtained at Moskovskiy energeticheskiy institut (Moscow Institute of Power Engineering) and at Institut mekhaniki AN USSR (Institute of Mechanics, AS USSR) are mentioned. There are 150 references.

Card 1/1

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